

1 a central station connected to said communication network configured to  
2 receive and analyze said transmission of digital performance data,  
3 wherein said digital data includes an identifier unique to a particular  
4 aircraft.

1 5. The aircraft maintenance system of claim 4 wherein said transmitter is  
2 positionable on <sup>said</sup> (an) aircraft having a flight data recorder and at least a portion of said  
3 digital performance data comprises data directed to said flight data recorder.

1 6. The aircraft maintenance system of claim 4 further comprising:  
2 a sensor multiplexer located on said aircraft, said sensor  
3 multiplexer having a plurality of inputs for receiving aircraft performance  
4 and control parameters from existing aircraft sensors, and an output in  
5 communication with said transmitter for providing said digital  
6 performance data to said transmitter.

1 7. The aircraft maintenance system of claim 4 wherein said digital  
2 performance data further includes digitized audio information.

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8. The aircraft maintenance system of claim 4 wherein said digital performance data further includes digitized video information.

9. The aircraft maintenance system of claim 5 wherein said digital performance data includes aircraft position data directed to said flight data recorder.

10. The aircraft maintenance system of claim 9 wherein information provided by a GPS receiver is used in the calculation of said aircraft position data.

11. The aircraft maintenance system of claim 10 wherein information provided by an inertial navigation system is used in the calculation of said aircraft position data.

12. The aircraft maintenance system of claim 4, wherein said central station is further configured to transmit digital data on said communication network, further comprising:

a receiver on said aircraft configured to receive digital data from said

communication network; and

a maintenance communication means, located on said aircraft, for

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7 providing maintenance advice to maintenance personnel, said  
8 maintenance communication means having an input for receiving  
9 said maintenance advice from said receiver,  
10 wherein said maintenance advice is transmitted from said central station to  
11 said receiver.

13. The aircraft maintenance system of claim 12 wherein said maintenance  
— advice is provides<sup>d</sup> aurally to said maintenance personnel.

14. The aircraft maintenance system of claim 8 wherein said central station  
B { includes a storage system for storing said aircraft performance and control parameters.

15. An aircraft <sup>not in claim but,</sup> maintenance system comprising:  
a transmitter configured for transmission of data across a communication  
network, said transmitter positionable to be located on an aircraft;  
a ground based station connected to said communication network  
configured to receive said transmission of data; and  
a sensor multiplexer located on said aircraft, said sensor multiplexer  
having a plurality of inputs for receiving aircraft performance and

8 control parameters from aircraft sensors and an output in  
9 communication with said transmitter for providing said data to said  
10 transmitter;  
11 *note* wherein said digital data further includes an aircraft identifier unique to a  
12 particular aircraft.

1 16. The aircraft maintenance system of claim 15, wherein said ground based  
2 station is further configured to transmit data on said communication network, further  
3 comprising:  
4 a receiver located on said aircraft, said receiver configured to receive data  
5 from said communication network; and  
6 a maintenance communication means which receives maintenance  
7 advisory data from said receiver and provides maintenance advice  
8 to maintenance personnel,  
9 wherein said maintenance advice is transmitted from said ground based  
10 station to said receiver.

*store data*  
1  $\beta \rightarrow$  17. The aircraft maintenance system of claim 15 wherein said ground based  
2 station includes a storage system for archiving said aircraft performance and control

3 parameters.

1 7/21/29 18. A method for real-time monitoring and archiving of aircraft performance  
2 102 data including the steps of:  
3 5381140  
4 providing a performance sensor in an aircraft, said performance sensor  
5 having an output indicative of an aircraft performance parameter;  
6 electronically transmitting at least said aircraft performance parameter to a  
7 global communication network;  
8 receiving said aircraft performance parameter from said global  
9 communication network at a ground based station; and  
10 archiving said aircraft performance parameter at said ground based station.

11 19. A method for determining whether to issue an aircraft maintenance  
12 advisory according to claim 18 including the steps of:  
13 performing the method of claim 18;  
14 analyzing said performance parameter;  
15 transmitting an aircraft maintenance advisory when the analysis of said  
16 performance parameter indicates an aircraft problem;  
17 receiving said maintenance advisory on said aircraft; and

8 displaying said maintenance advisory on said aircraft.

1 340/945<sup>t</sup> 20. An in-flight advisory system comprising:  
2 a transmitter for transmitting an advisory to an aircraft in a digital form;  
3 a receiver located in said aircraft configured to receive said digital form of  
4 said advisory; and  
5 a display means for displaying said advisory in said aircraft,  
6 wherein said advisory includes an identifier exclusive to said aircraft.

1 21. The in-flight advisory system of claim 20 wherein said advisory  
2 comprises information selected from the group consisting of:

- 3 (a) weather information;  
4 (h) air traffic control information; and  
5 (i) area traffic data.

1 22. An in-flight advisory system comprising:  
2 a transmitter for transmitting an advisory to an aircraft in a digital form;  
3 a receiver located in said aircraft configured to receive said digital form of  
4 said advisory; and

5 a display means for displaying said advisory in said aircraft,  
6 wherein said advisory comprises information selected from the group  
7 consisting of:  
8 (a) flight separation information;  
9 (b) topographical information;  
10 (c) wind shear information;  
11 (d) lightning information;  
12 (e) emergency information;  
13 (f) crash avoidance information;  
14 (g) information from the manufacturer of said aircraft;  
15 (h) air traffic information;  
16 (i) area traffic information;  
17 (j) safe to take off information; and  
18 (k) safe to fly information.

1 23. An in-flight advisory system comprising:  
2 a transmitter for transmitting an advisory via a global communication  
3 network;  
4 a receiver located in said aircraft configured to receive said advisory; and

5 a display means for displaying said advisory in said aircraft.

1 24. A digital data communication system for an aircraft comprising:  
2 a transceiver located on the aircraft, said transceiver configured to transmit  
3 and receive digital data to and from a global communication  
4 network; and  
5 a central station configured to transmit and receive digital data to and from  
6 said global communication network,  
7 wherein a transmission by an aircraft on said global communication  
8 network includes an identifier, said identifier being unique to a  
9 particular aircraft.

1 25. The digital data communication system of claim 24 further comprising:  
2 a sensor multiplexer having a plurality of inputs for receiving information  
3 from a plurality of aircraft sensors, said information including the  
4 position and heading of said aircraft, and an output for digitally  
5 communicating said information to said transceiver for  
6 transmission via said global communication network.



1           26.    The digital data communication system of claim 25 wherein said plurality  
2 of aircraft sensors includes a GPS receiver.

1           27.    The digital data communication system of claim 25 wherein said plurality  
2 of aircraft sensors includes an acoustic sensor for receiving audible information.

1           28.    The digital data communication system of claim 24 further comprising a  
2 display means on said aircraft, said display means configured to display information  
3 encoded in said digital data received by said transceiver.

1           29.    The digital data communication system of claim 24 wherein said central  
2 station includes data storage and at least a portion of said digital data transmitted from  
3 said aircraft is stored in said data storage.

1           30.    The digital data communication system of claim 29 wherein said portion  
2 of said digital data includes data selected from the group consisting of:

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4                    (b)    aircraft attitude;  
5                    (c)    fuel status of the aircraft;

- 6                    (d)     engine status of the aircraft;  
7                    (e)     flight control positions;  
8                    (f)     landing gear status; and  
9                    (g)     control surface positions.
- not in  
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1                    31.     The digital data communication system of claim 30 wherein said portion  
2 of said digital data is analyzed at said central station to determine if a flight safety  
3 advisory or a maintenance advisory is warranted.

1                    32.     The digital data communication system of claim 31 further comprising a  
2 display means on said aircraft, wherein said central station transmits said flight safety  
3 advisory or said maintenance advisory to said transceiver and said display means is  
4 configured to display said flight safety advisory or said maintenance advisory.

1                    33.     A digital data communication system for an aircraft comprising a receiver  
2 configured to receive a transmission from a central station, said transmission being  
3 relayed to said receiver by way of a satellite and said transmission comprising digitally  
4 encoded information, wherein said digitally encoded information includes an identifier  
5 unique to a particular aircraft.

1                    34.    The digital data communication system of claim 33 wherein said digitally  
2 encoded information includes weather information.

1                    35.    The digital data communication system of claim 33 wherein said digitally  
2 encoded information includes maintenance advisory information.

1                    36.    A telemetric crash data recorder comprising:  
2                    a sensor multiplexer receiver and transmitter; and  
3                    a central ground based station having a data storage device,  
4                    wherein said sensor multiplexer receiver and transmitter receives aircraft  
5                    performance and control parameters from existing sensors on an  
6                    aircraft and transmits said performance and control parameters to  
7                    said central ground based station over a world wide  
8                    communication system for storage in said data storage device.

1                    37.    The telemetric crash data recorder of claim 36 further comprising:  
2                    a GPS receiver in communication with said sensor multiplexer receiver  
3                    and transmitter such that a position of said aircraft is transmitted to

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4 said central ground based station.

1 38. The telemetric crash data recorder of claim 37 wherein said central ground  
2 station includes a processor for analyzing performance and control parameters and said  
3 aircraft position such that, in the event of a crash, said processor will calculate a crash  
4 site.

1 39. The telemetric crash data recorder of claim 37 wherein said performance  
2 and control parameters comprise information recorded by an on board flight data  
3 recorder.

1 40. An air traffic control system comprising:  
2 a radio frequency transceiver located on an aircraft, said radio frequency  
3 transceiver configured to transmit and receive digital information;  
4 an inertial navigation system located on said aircraft, said inertial  
5 navigation system providing the position of said aircraft to said  
6 transceiver; and  
7 an air traffic control facility configured to receive and display said position  
8 of said aircraft to an air traffic controller.

1           41.    The air traffic control system of claim 40 further comprising a GPS  
2 receiver, wherein said position of said aircraft is augmented with data from said GPS  
3 receiver.

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1           42.    An improved air traffic control system of the type having an air traffic  
2 control facility wherein air traffic controllers observe a radar image of controlled aircraft,  
3 the improvement comprising:

4                   a ground based station comprising:

5                           a receiver for receiving precision navigation information from the

6                                   controlled aircraft;

7                           a ground communication system in communication with the air

8                                   traffic control facility,

9                   wherein said precision navigation information is transmitted to the air

10                           traffic control facility over said ground communication system to

11                           enhance the information provided to the air traffic controllers.

1           43.    The improved air traffic control system of claim 42 wherein said ground  
2 communication system includes a fiber optic link between said ground based station and

the air traffic control facility.

701 301 44. A ground collision avoidance system for an aircraft comprising:  
a positioning system for providing an aircraft position;  
a transceiver for transmitting said aircraft position and receiving a position  
of nearby aircraft;  
a display for displaying said position of nearby aircraft relative to said  
aircraft position,  
wherein each aircraft which transmits an aircraft position has a unique  
identifier and said unique identifier is included in each  
transmission.

45. The ground collision avoidance system of claim 44 wherein said  
positioning system comprises an inertial navigation system.

46. The ground collision avoidance system of claim 45 wherein said  
positioning system further comprises a GPS receiver.

1                   47.    The ground collision avoidance system of claim 45 wherein said aircraft  
2 includes a flight data recorder and said positioning system provides data to said flight  
3 data recorder.

1                   48.    The ground collision avoidance system of claim 45 wherein said  
2 positioning system further provides an aircraft heading and wherein said transceiver  
3 transmits said aircraft heading.

1                   49.    A method for transmitting and receiving aircraft performance and control  
2 parameters comprising:

3                               providing a sensor multiplexer on an aircraft for receiving information  
4                               from aircraft sensors;

5                               transmitting said information to a communication network with a first  
6                               transceiver aboard said aircraft, said first transceiver configured to  
7                               transmit digital information on said communication network; and  
8                               receiving said digital information at a ground station having a second  
9                               transceiver configured to receive information from said  
10                              communication network.

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50. An aircraft having a global digital communication system comprising:  
a transceiver for digital communication over a global communication  
system;  
an in-cockpit display having a display means, said display means receiving  
flight advisory data from said transceiver, and an operator input  
means; and  
a multiplexer for receiving information from aircraft sensors and from said  
in-cockpit display, said multiplexer having an output in  
communication with said transceiver for transmitting said  
information over said global communication network,  
wherein said information comprises aircraft performance and control  
parameters provided to a flight data recorder on board the aircraft.

51. The aircraft of claim 50 wherein said flight advisory data includes at least  
one advisory from the group consisting of:  
(a) weather advisory;  
(b) air traffic advisory;  
(c) anti-collision advisory; and



(d) ground incursion advisory;

(e) flight information advisory;

52. The aircraft of claim 50 wherein said flight advisory information includes a maintenance advisory wherein said maintenance advisory is transmitted from a ground station to said transceiver over said communication upon the receipt and analysis of said information.

701301 53. A method for avoiding an in-flight collision including the steps of:

- (a) transmitting an identifier from an aircraft, said identifier being unique to said aircraft;
- (b) transmitting the position of said aircraft wherein said position of said aircraft includes a heading of said aircraft;
- (c) receiving said identifier and said position at a central station;
- (d) analyzing said position of said aircraft relative to other objects and the ground to determine a risk of collision;
- (e) sending a flight safety advisory to said aircraft when said analysis indicates there is a risk of collision.

54. The method of claim 53 wherein the position of step (b) further includes:

- the altitude of said aircraft;
- the latitude of said aircraft;
- the longitude of said aircraft; and

55. The method of claim 54 wherein the position of step (b) further includes:  
the pitch position of said aircraft; and  
the roll position of said aircraft.

56. The method of claim 55 wherein the position of step (b) further includes;

the rate of climb of said aircraft;

the velocity of said aircraft;

the yaw rate of said aircraft;

the pitch rate of said aircraft; and

the roll rate of said aircraft.

57. The method of claim 53 wherein step (b) includes the substeps of:

(b)(i) obtaining a position of said aircraft from the inertial reference system of said aircraft; and

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4 (d)(ii) analyzing said separation distance and the position of said aircraft  
5 relative to the ground to determine a risk of collision.

1 61. The method of claim 60 further including the steps of:

2 (f) sending said separation distance to said aircraft;

3 (g) displaying said separation distance to the flight crew of said  
4 aircraft.

1 340/945 62. A safe to take off advisory system comprising:  
2 a transceiver located in said aircraft configured to transmit aircraft  
3 performance and control parameters and to receive a safe to take  
4 off advisory; and  
5 a central station for receiving said aircraft performance and control  
6 parameters and transmitting said safe to take off advisory to an  
7 aircraft based on said performance and control parameters;  
8 a display means for displaying said safe to take off advisory in said  
9 aircraft.